



VOLUME XIII SEPTEMBER 1957 NUMBER 9

3 Clinical Proceedings

OF THE

2 CHILDREN'S HOSPITAL
1 WASHINGTON, D. C.

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iron deficiency
in infants...

How Fer-In-Sol improved infants' blood pictures

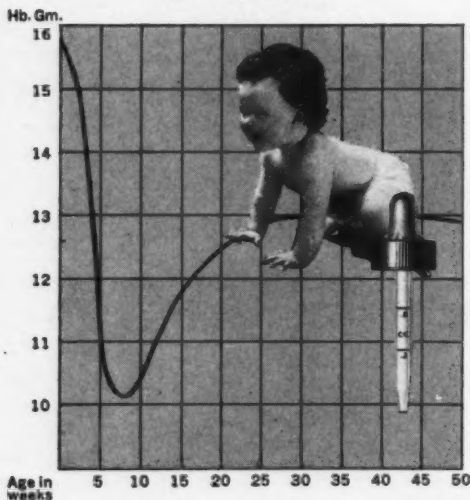


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¹ Niccum, W. L.; Jackson, R. L., and Stearns, G.: A.M.A. Am. J. Dis. Child. 86: 553, 1953. ² Smith, C. H.: Bull. New York Acad. Med. 30: 155, 1954. ³ Smith, N. J., and Rosello, S. J.: Clin. Nutrition 1: 275, 1953. ⁴ Sturgeon, P.: Pediatrics 13: 107, 1954.

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PUBLISHED MONTHLY BY THE STAFF AND RESEARCH FOUNDATION OF THE CHILDREN'S HOSPITAL, WASHINGTON, D. C.

Cases are selected from the weekly conferences held each Friday at 12:30 P.M., from the Clinicopathological conferences and from other Staff meetings.

This bulletin is printed for the benefit of the present and former members of the Attending and Resident Staffs, and the clinical clerks of Georgetown and George Washington Universities.

Subscription rate is \$3.00 per year. Those interested make checks payable to "Clinical Proceedings Dept." The Children's Hospital, Washington, D. C. Please notify on change of address.

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Entered as second class matter November 21, 1946 at the post office at Washington, D. C., under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 533, Act of February 28, 1925, authorized January 17, 1947.

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY
RESEARCH REPORT NO. 1000

BY
J. H. GOLDSTEIN
AND
R. L. SEXTON

RECEIVED BY THE DEPARTMENT OF CHEMISTRY
JANUARY 10, 1955

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PYURIA IN CHILDREN

A PANEL DISCUSSION

Sydney Ross, M.D.,* Leonard B. Berman, M.D.,† Allan B. Coleman, M.D.,‡ Hamilton P. Dorman, M.D.§

Dr. Coleman:

I do not like the term "pyuria". Let us talk about infection of the urinary tract. The first point to consider in infections of the urinary tract is their relationship to the differential diagnosis of fevers of undetermined origin. Children with definite urinary symptoms do not present any particular problem in diagnosis. Our attention is immediately focused on the urinary tract. The young child or the infant, particularly the female infant, with unexplained fever, who does not have urinary tract symptoms tends to be more of a diagnostic problem. This is true in spite of the fact that most of us know that the urine must be searched for pus in every instance of unexplained fever, particularly in little girls. I do not know why little girls with serious infections of the urinary tract frequently do not have urinary tract symptoms of any sort. If they are under 2 years of age frequently one cannot elicit costovertebral angle tenderness in the presence of serious pyelonephritis. The *only* symptom may be fever. This is one of the very good reasons for keeping catheters available in the office. I feel that every child who has an unexplained fever ought to have his urine examined. Little girls' urine should certainly be examined after having been obtained by catheter.

Dr. George Maksim, some years ago introduced me to little glass catheters which one can get for about two dollars a dozen from the glass blower who makes them for the Mayo Clinic. I have had the same dozen for about 6½ years. We keep them in the sterilizer with the syringes in the office, and use them very frequently.

Once the diagnosis has been made by the finding of innumerable pus cells (many of which are clumped) plus a faint trace of albumin, in a catheterized, uncentrifuged urine specimen in a little girl, (or a clean voided specimen in a boy), the problem then turns to bacteriologic diagnosis and antibiotic therapy.

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What about the child who has urinary symptoms without fever? This, in my experience, is usually a little girl between 3 and 7 years of age who has a red vulva. I saw two girls in this age group a few years ago who had terminal dysuria. They had normal urinalyses; they had normal urinary tracts by x-ray examination; their urines were sterile; but nevertheless they continued to have terminal dysuria. In examining their external genitalia it came to my attention that they had adhesions between the clitoral prepuce and the glans clitoris. One of these children had such severe pain that I asked a urological surgeon to separate the adhesions under anesthesia and was hoping to have him circumcise her. However, her symptoms cleared up after the first procedure, and her mother was able to keep the adhesions freed after that. I subsequently saw the other child whose symptoms promptly cleared up when these adhesions were broken with a probe after first applying xylocaine jelly over her clitoris. I have never seen this syndrome reported.

I have seen another group of little girls who have pyuria with dysuria, but without fever, who, I think, have ascendingly induced cystitis because of lack of the normal hygiene at the toilet. Their vulvae appear inflamed but they clear up very promptly when given almost any type of antibiotic or sulfonamide. Recurrences are frequent. I have investigated a number of them with excretory urograms and found that they do not have abnormality of their urinary tracts. The only thing that seems to correct the condition is moist toilet tissue used in such a manner that feces is not dragged up into the vulva, and the frequent use of a hexachlorophene-containing soap or detergent on the vulva.

I have seen a few little girls with severe adhesions between their labiae minora. There have been some recent articles on the treatment of this condition with estrogen. Some authors advise not treating them at all since they all get well. And yet, I seem to see them associated with urinary tract infection. I remember one little girl who came in with the history that when she sat down at the toilet to void, she sprayed. She had labia minora adhesions up to, but not quite including, the clitoris and a pinhole opening through which the urine came. Her urine was loaded with pus; however, separating the adhesions and liberally applying nupercaine ointment many times a day to keep the area anesthetized and free of adhesions, cleared her urinary tract infection without any other treatment.

The next thing about which the pediatrician should be concerned is the question of whether a urinary infection means that a child has a urinary anomaly? We used to have a "rule" that little boys with urinary tract infections should have their urinary tracts investigated the first time; little girls, the second time. Perhaps little girls also ought to be investigated the first time. Dr. John Askin and his group from Baltimore have recently presented

a very large series, in the form of an exhibit, of x-ray findings on excretory urography in little girls. The percentage of anomalies was almost as high as that seen in boys with recurring urinary tract infection. I think it behooves the clinician to have in mind that urinary tract infection may very well mean urinary anomaly and to assure himself, either on the first or certainly on the second episode, that an important urinary anomaly with stasis does not exist.

Dr. Dorman:

The urologist's role in the investigation of pyuria falls into two groups: first, the persistent, acute pyuria, and second the recurrent, or chronic pyuria. All these patients who fall into either of these categories should first have intravenous pyelograms; at this time most genitourinary deformities can very easily be diagnosed. If the intravenous pyelogram is normal, cystoscopy should be considered, depending upon the individual case. If defects are shown, cystoscopy and retrograde studies should be considered.

I would like to re-emphasize Dr. Coleman's point that all female children be taught to cleanse themselves by wiping in an anterior-posterior direction. So many will take the short route and wipe in the opposite direction, and the normal bacteria that are found in the rectum are easily spread into the urethra. This I think accounts for a large percentage of pyuria cases in small girls. Personal hygiene in these small children is most important.

Of the abnormalities predisposing to urinary infection, I would first like to mention stenosis of the external urethral meatus, most commonly found in the boy. This may produce stasis of a degree sufficient to result in hydro-nephrosis. Meatotomy, which is all that is necessary, is a simple procedure. There is no reason why the pediatrician cannot do a meatotomy as an office procedure.

Phimosis is another common anomaly which can cause a pinpoint urethral opening in male children. Circumcision corrects this condition.

Congenital valves of the posterior urethra again may cause obstruction, stasis, and infection. These should be resected transurethraly. Congenital stricture of the urethra also occurs. Dilatation is the treatment.

In the girl in whom the hymen is imperforate the hydrocolpos produced frequently becomes infected and gives rise to secondary infection in the bladder. The proper treatment for this is rupturing the hymen.

Epispadias and hypospadias are also causes of recurrent urinary infection. Surgical repair is the treatment.

Contracture of the vesicle neck is a congenital deformity in which the vesicle neck itself is contracted and residual urine is retained. Transurethral resection of the vesicle neck completely relieves the obstruction. The same

is true for median bar formations which do not commonly occur in children, however.

A diverticulum of the bladder is an outpocketing of the bladder in which urine will pool and infection arise. Vesicle stones are sometimes found in conjunction with these. Cord bladder and atonic bladder are two other causes for recurrent urinary infection rarely found in children. Extrophy of the bladder is another cause which should be mentioned.

Foreign bodies in the bladder are sometimes found in the older children and are an important cause of recurrent pyuria.

In considering anomalies of the ureters we first have anomalies in number such as a double ureter draining a second pelvis of the kidney. One of these ureters may be obstructed. Anomalies of termination, in other words, a single or double ureter, may sometimes end in the seminal vesicle of the male, in the posterior urethra in either the male or female, or sometimes in the vagina in the female child.

Ureterocele is another condition which must be considered. This may be either unilateral or bilateral. It consists of an outpocketing of the ureteral mucosa with a pinpoint opening causing secondary obstruction. These can usually be resected transurethrally, or in the very small children suprapubically.

Another anomaly of the ureter that should be considered is atony, or megaloureter in which the ganglia supplying the ureter are either not present or diminished in number with resultant relaxation of the wall. With lack of ureteral peristalsis there is a urinary stasis.

Uncommonly retrocaval ureter may occur. This is seen only on the right side; the ureter descends normally but passes behind the vena cava and encircles it. The pressure of this vessel on the ureter sometimes causes obstruction of the urine flow.

A more commonly found anomaly is stricture of the ureter as it leaves the renal pelvis. This is a ureteropelvic junction obstruction causing secondary hydronephrosis. The stricture is usually an intrinsic stricture of the ureter located in the wall, and surgery is the cure. It may be unilateral or bilateral. If bilateral, we usually repair the less severely involved side first because it is sometimes necessary to perform a nephrectomy on the more severely involved side.

In the kidney itself, there may be a double pelvis associated with a double ureter. A high insertion of the ureter may occur; instead of originating from the deep-ended portion of the pelvis of the kidney, it may arise from the superior pole of the pelvis with resultant pooling of urine in the pelvis. An accessory or aberrant renal vessel is another cause of stasis of urine from pressure of this artery, or vein, or both, on the ureter as it leaves the renal pelvis.

Renal ptosis is mentioned merely for completeness' sake, but is not commonly found in children. Renal lithiasis must also be considered as a source of pyuria, but is very uncommon in children.

These are very briefly outlined causes of obstruction in the urinary tract in children, which may secondarily produce stasis and infection. Atony of the bladder, and cord bladder are the only ones for which we could not do something. The rest are amenable to surgery.

I must disagree with Dr. Coleman's use of the glass catheter. Rubber gives on tissue, and I feel that there is less trauma in using a rubber catheter. Catheterization is still a one-handed procedure.

Dr. Ross:

The organisms that cause urinary tract infections in the pediatric age group do not differ materially from those observed in adults. The gram-negative organisms are by far the most common, (seventy-five per cent). These would include *Escherichia coli*, *Aerobacter aerogenes*, *Proteus*, *Pseudomonas*, and paracolon bacillus. The gram-positive organisms which are not commonly encountered, (twenty-five per cent), would include *Staphylococcus aureus*, beta hemolytic streptococcus, and *Streptococcus faecalis*.

Sulfonamides are still effective agents, by and large, against the majority of gram-negative organisms, although there are certain strains which are resistant to sulfa. As to whether a single sulfonamide such as sulfadiazine would be less desirable than a triple sulfa preparation because of the greater solubility of the latter, or whether sulfisoxazole is the drug of choice is a point of personal preference. Sulfisoxazole is quite effective against most of the gram-negative organisms that might be causative agents of urinary tract infections, and I think perhaps the urologists favor this preparation above the other available sulfonamides. However, quite candidly, I do not think it much matters which sulfonamide preparation you employ.

Penicillin of course has no effect against most gram-negative organisms and hence this consideration limits rather sharply its use in the treatment of urinary tract infections. Also, as you well know, the increasing incidence of penicillin resistant strains of *Staphylococcus aureus* would likewise limit its virtue. However, certainly, against a beta hemolytic streptococcus, penicillin would be the drug of choice.

For quite a while before the advent of the broad spectrum antibiotics streptomycin enjoyed a considerable vogue in the treatment of acute pyelonephritis because of its efficacy against gram-negative organisms. The drawbacks of streptomycin however, are well known to you. First of all, the possibility of eighth nerve involvement with streptomycin must be mentioned although in the short course of therapy that one generally employs in the treatment of a urinary tract infection, eighth nerve complica-

tions would not be too likely. A more cogent objection to the use of streptomycin is the fact that organisms develop resistance very quickly to this drug. If streptomycin is used it is important to alkalinize the urine, since the drug exerts greater inhibitory effect in an alkaline urine than in an acid urine.

The broad spectrum antibiotics including the tetracyclines and chloramphenicol have been employed with considerable success in the treatment of urinary tract infection and one might say these drugs constitute the treatment of choice. As with all urinary tract infections, however, the results are much better in *acute* pyelonephritis and less satisfactory in chronic cases. Many strains of *E. coli*, which is the organism most frequently found in acute infections, are still sensitive to the broad spectrum antibiotics. However, some strains are resistant and hence the importance of sensitivity determinations must once again be emphasized. *A. aerogenes* strains are generally more resistant to broad spectrum antibiotics than are *E. coli* strains and hence may result in less consistently good results. Two other gram negative rods which are of importance in acute pyelonephritis include *Pseudomonas* and *Proteus*. The broad spectrum antibiotics have been disappointing in the treatment of these infections since the majority of organisms are highly resistant. Even though many strains were resistant at the time the broad spectrum antibiotics were introduced, the problem has become even worse in the last few years because there has been an increased number of resistant strains isolated among hospitalized patients. However, in spite of these drawbacks the broad spectrum antibiotics occupy a major position in the treatment of acute pyelonephritis due to gram negative bacilli. It is well to point out also that broad spectrum antibiotics are also effective against the gram positive cocci which cause 25 per cent of the urinary tract infections in children. This broad coverage is particularly attractive when patients are treated in office practice and where the offending organism is not known. Again, it is important to re-emphasize the desirability of prompt sensitivity determinations in order to guide the proper therapy intelligently.

Of the other available antibiotics, polymyxin would have some virtue in the treatment of *Pseudomonas* infections. As you well know, *Pseudomonas* is usually resistant to most antibiotics except polymyxin. However, it is important to bear in mind that one must use a proper dosage of polymyxin because of its nephrotoxicity and the possibility of beclouding the whole urinary picture by the use of this drug. A regime of 3 to 5 milligrams per kg. of body weight per 24 hours in a 6 hour divided dosage schedule usually will suffice and not produce toxic manifestations. However, polymyxin should be reserved for *Pseudomonas* urinary tract infection where no other drug appears to be efficacious as judged by sensitivity determinations.

Furadantin® appears to have enjoyed a wider vogue among our urologist friends than among pediatricians. However, it does have some virtue. I have seen instances where an organism was insensitive to everything except Furadantin®, and clinically it proved to be an efficacious agent, particularly against some *E. coli* and *Proteus* strains.

In urinary tract infections prompt sensitivity determination of the offending organism is extremely important. It is pointless to speculate on the potential sensitivities of various organisms for the simple reason that some strains are sensitive to a given drug and some are not, and the only way one can know is actually to do a sensitivity determination. The disc sensitivity method has the advantage of ease of performance, which I might add is its chief recommendation. If one does not ascribe too much quantitative significance to disc sensitivity testing, and if one is content to say *only* that a given organism is sensitive or resistant avoiding any reference to the degree of sensitivity, he will not exceed the limits of the reliability of the procedure. The serial dilution method is considerably more reliable, but many laboratories are not equipped to perform this method.

What are the reasons for therapeutic failures in the treatment of urinary tract infections? The two most frequent causes would be 1) the use of drug against a resistant organism, and 2) the presence of unrelieved urostatics, problems which Dr. Coleman and Dr. Dorman have already discussed. The average duration of antibiotic therapy in acute pyelonephritis is about 5 to 7 days. Campbell recommends 10 to 14 days of therapy, and perhaps has a good point. It may be that we should not regard the end point of therapy as the subsidence of symptoms and clearing of the urine.

Just one additional comment. Not uncommonly one encounters a mixed urinary tract infection. Also, it is well to point out that during the course of therapy there may be replacement of one organism by another. One might start out with *E. coli* as the original offender and end up with a *Proteus* and *Pseudomonas*. Whether this is due to iatrogenic infection by catheterization, or whether we are depressing the more sensitive organisms, and permitting the more resistant strains to take over, I do not know.

Dr. Berman:

Pyuria means an inflammatory response somewhere in the genitourinary tract, and it by no means has to be the inflammatory response of an infection. For example, acute glomerulonephritis is, both on biopsy and on urine sediment examination, very often associated with an acute polymorphonuclear response, and the urine can be loaded with both this type of cell and pus cell casts as well as glitter cells. The same reasoning is true of disseminated lupus erythematosus and the glomerulitis of that disease. Again, the urine can be flooded with polys just as a manifestation of what is, in effect, a

sterile inflammatory response in the renal parenchyma. Renal infarcts follow the same pattern.

If we agree to confine ourselves to the pyuria of infection I think that we ought to begin by trying to distinguish whether all of the genitourinary tract is affected, or whether it is the kidneys, the bladder, or the ureters alone. Dr. Ross spoke of "pyelitis". We do not believe this exists, either in humans or in animals. We think that pyelitis (which by definition is an inflammation of the renal pelvis) remains that way only for a few hours at the most, and that every case of pyelitis is in reality pyelonephritis. This is important for many reasons, but perhaps the main reason is the indication for therapy and for criteria for adequacy of therapy. If a patient has an acute pyelonephritis with all the classical symptoms: fever, flank pain, elevated white count, pyuria, and glitter cells, and if such a patient is not treated, the course of events may be exactly the same as if treatment were given. It is frequently, in clinical terms, a "self-limited" disease in which the urine becomes sterile and free of pus, whether or not treatment is given.

The point that is becoming more and more evident by study of biopsy tissue is that pyelonephritis, regardless of clinical aspects and urine findings, is a very persistent tissue disease of the kidney, in many respects similar to subacute bacterial endocarditis. Bacteria are able in this situation to lodge within the renal cortex, primarily, and to surround themselves with avascular tissue and thus be almost impossible to dislodge. For that reason we think that, having decided that somebody has pyelonephritis, an adequate course of treatment cannot be less than a month of an appropriate antibiotic. We have even pushed this concept a little further by having treated such patients with adequate antibiotics, chosen by culture and sensitivity, for this period of time, and then continued the treatment for yet another month with one of the sulfonamide drugs.

Furadantin® is a very interesting drug for many reasons. It was designed to behave a specific way, that is, to be excreted very rapidly, and is present therefore in the bladder urine in high concentration. This is exactly why Furadantin® is a worthless drug for pyelonephritis. It develops no blood levels whatsoever, at least, by our crude ways of measuring it. It has therefore, no effect against tissue infection which is the crux of the problem in pyelonephritis, but it does sterilize bladder urine beautifully, as long as it is present. It has been everybody's experience that when Furadantin® is discontinued, more often than not there is a prompt relapse of the bladder infection.

Polymyxin, neomycin and bacitracin are all polypeptides, and share among themselves a very definite nephrotoxicity. Dr. Ross mentioned this;

I want to back him up strongly. In people with normal renal function this might not be a clinical problem, but perhaps he will agree that one should be extremely cautious in giving it in the face of renal impairment, that is, with an elevated blood urea nitrogen, or diminished phenol-sulfophthalein excretion. Anuria, a rising azotemia or a heavier degree of proteinuria may all be produced. Probably because the patients that we see almost universally have functional impairment, we have really never had the opportunity to use these drugs, and our comments therefore, are derived from the experience of others.

Everybody dealing with the problem has poor or no luck in eradicating a well established, chronic pyelonephritis. Shall one keep administering antibiotics? From our experience it seems that the answer will be that with rare exceptions, the same result is accomplished whether the antibiotics are given indefinitely or whether therapy is stopped after any given period of time. We have not yet solved the problem of a chronic pyelonephritis insofar as bacteriologic cure or even prevention of recrudescences.

THE ADOLESCENT UNIT

PANEL DISCUSSION

Robert H. Parrott, M.D.,* William F. Burdick, M.D.,† Walter E. Ahrens, M.D.,‡ Jane Donnelly, R.N.,§ Henry H. Lichtenberg, M.D.,|| Belinda Straight, M.D.¶.

Dr. Parrott:

We at the Children's Hospital have recently seen fit to raise the age limit on patients admitted, and along with that, to provide a physical facility for teen-aged patients which is separate from that for the younger children. We hope that in creating separate facilities and in re-orienting our thinking, we will afford a happier place for the teen-ager to be hospitalized if and when the occasion arises. Eventually, we hope to have an active outpatient service and, in a study sense, to learn first-hand about teen-agers. In so doing we hope to discover how well we are accomplishing our purpose, and how well we as pediatricians understand and care for this group.

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Dr. Burdick:

We usually think of children 12 years of age and older as falling into the "age of adolescence". This period is sometimes over at 18 years of age but frequently may extend up to 21 years. Many boys and girls younger than 12 have reached sufficient maturity so that they would naturally fall into this group.

It seems logical to me that the pediatrician should be the physician to interest himself in the adolescent, since it is he who has the child's health records from birth and he is the one in whom the patient has learned to trust and confide. Certainly the specialty of pediatrics deals with the period of life from birth to maturity and it seems to me that the 12 year old is hardly mature; neither has he stopped growing.

There are only two categories recognized by many physicians: children, and adults. Both children and adults have been studied very thoroughly and their emotional and medical needs met very well. This in-between group between the child and the adult has not come in for very much study and has been a rather neglected group. This was realized at Children's Hospital in Boston about 5 or 6 years ago, and Doctor J. Roswell Gallagher has been a pioneer in establishing an outstanding unit at that hospital. Problems of the adolescent are considered, and research into these problems is taking place.

Adolescents, of course, are subject to all the stresses and strains and imbalances which enter into emotional and physical growth, and the physician who is really interested in this group needs first of all to be interested in them as people and as human beings. The adolescent must be led to feel that the doctor is not only interested in his symptoms, but is also interested in *him*.

The adolescent has many problems and conditions peculiar to his own age group. Dysmenorrhea is a common problem and one the average pediatrician is poorly equipped to handle. Problems of fatigue, especially in maladjusted patients, may be of major importance. Sex problems of both boys and girls are quite common. The acne problem is terrific, and low back pain is also a common problem. Ulcerative colitis is relatively frequently seen in this age group. Scholastic failures in those with normal mental capacity often come to the fore. Dr. Gallagher has made a signal contribution in this latter group. Hypothyroidism and hyperthyroidism, and problems of obesity are also more likely to arise in the adolescent.

There are many pediatricians who have no interest at all in the teen-ager. As soon as the child reaches 12 or 13 years of age, and the problems of routine immunization and childhood diseases are no longer present, this type of pediatrician wants no more to do with him. I think that if a pediatrician feels this way, he certainly should not attempt to care for the adolescent,

since one must be vitally interested in the welfare of the teen-ager in order to do a good job. Instead of doing a disinterested job, himself, I feel that such a pediatrician should refer the patient to an interested, competent internist, generalist, or pediatrician who wants to work with these fascinating and challenging people.

The adolescent unit at this hospital has been in operation a little more than a month and although we have a satisfactory teen-age ward in operation, we feel that we have only scratched the surface. We are currently just caring for the inpatient ailments of young people over 12 years of age. We hope that in the future we can develop a successful outpatient clinic for this group. We hope also to start accumulating data in a much needed field and eventually plan to initiate some long-range research projects.

Dr. Ahrens:

When the Teen Unit was initiated in January 1957 as an inpatient ward for adolescents I had a unique opportunity as the first resident to attempt to meet the needs of these patients. I am sure that the Unit, the patients, the other members of the staff and I all shared in some normal growing pains together.

Our initial unit had consisted of a part of a pediatric floor with one and three-bed rooms staffed by two pediatric advisors, a psychiatric counselor, a most valuable group of willing and patient nurses and aides, and myself. Most of our clinical material has been provided by the private physician with an occasional clinic referral.

In the first month of operation of our adolescent unit we have had 26 patients; 9 were boys, 17 were girls; 5 were negro, 21 white; 6 were under staff care, 20 under private care. They ranged in age from 11 to 21 years. The vast majority, as has been the experience of the Kaiser Clinic which has set up an adolescent outpatient clinic, are in the lower age group of adolescents with a single 21 year old at the upper end. There were 12 patients with primarily medical disorders, 11 with primarily surgical disorders, and 2 with primarily psychiatric disorders.

What types of problems have we seen? We have seen some very real medical problems and it is a good refresher course after one's internship to see again the diseases which we do not see much of in the smaller children. We have also seen many emotional problems which were minor in most part, but indicative of the type prevalent in this group. Specifically what types of patients have we seen? We have seen one young lady with definite recurrent organic paralysis of her right leg of two years' duration. It subsided in the hospital; she is now home, and no one knows what happened. We have seen one young fellow whose illness was diagnosed as Guillain-Barre syndrome who has had marked weakness of his abdomen and both lower extremities, sensory disturbances, and temporary hypertension. There

was one boy with obscure abdominal pain who was studied extensively from the laboratory standpoint, and it was the private physician who finally pinned down the difficulty to oncoming exams about which the youngster was much disturbed. We have seen a young girl who the house staff thought had dysmenorrhea but who instead had an acutely inflamed appendix. We are learning.

Another girl had residual paralysis from poliomyelitis, and had had numerous surgical procedures. She was crippled physically, and had in addition a fractured leg, and had a considerable difficulty in adjusting to the fact that she must lie flat on her back in traction. We have seen recurrent active rheumatic fever in a girl with rheumatic heart disease of 4 or 5 years' standing. We have seen a child with unexplained fever, one with a head injury, and another with a peritonsillar abscess. We had a young lady with ulcerative colitis in whom a question of phlebothrombosis was raised; I wonder how many pediatricians have had occasion to consider a diagnosis of phlebothrombosis lately.

We have had some menstrual problems. One girl had abdominal pain and a little bleeding. She was admitted to the hospital, had a menstrual period, and went home. It was as simple as that. The question was raised as to whether there was any other pathology; there was none. I wonder if anyone explained to this youngster what menses are, that they are normal, and that she will not have to be hospitalized every time she has a period. Another 13 year old girl was admitted with menorrhagia, had profuse bleeding and received three blood transfusions. This child was, needless to say, extremely emotionally disturbed by the time she finally went home. At the time of the last transfusion she wept bitterly and said, "Well, I am going to die". We tried to convince her that this was not going to be so and she went on from there to say that she was going to be sick again. Will this be her interpretation of her future menses?

In taking a history I have attempted both taking a history from parent and patient together and the use of separate histories from each. A separate history is more time consuming but has several virtues. Often in a combined history the adolescent would not talk as freely if the parent were present. Further, the adolescent seems to appreciate the individual attention and often will speak of what concerns him most whether or not it pertains to his illness.

Physical examination presented no difficulty on the part of either sex. Gentleness, tact, and an explanation of procedures were helpful. The resident did no pelvic examinations and found rectal examination adequate and helpful when seemingly indicated.

We have had our growing pains. It took a while before the signs saying "No children under 16 allowed" came down. It took a while before the

bunny rabbit pictures came off the walls. The adolescent requires that the pediatrician do more than he is accustomed to in the one or two year old. He wants an explanation in terms he can understand of what is going on, what is wrong with him, what is going to happen and why things are being done to him.

We have problems of night snacks and whether adolescents can have visitors. We have not yet achieved entirely the hope of some adolescent outpatient clinics that these teen-agers would eventually have a feeling that this is "my ward" and "my doctor". An outpatient clinic is needed if for no other reason than to follow the youngsters that we have sent home.

Miss Donnelly:

At present, our adolescent ward consists of three three-bed rooms and three private rooms. Each room is equipped with a lavatory and standard adult equipment. These adolescent patients are cared for by nurses, nurses' aides, and practical student nurses. The staff really enjoys taking care of them as much as, if not more than, the younger patients. The practical student nurses get along especially well with these teen-agers because they have the common interests of popular music, dating, and dress.

Every morning each patient has a choice of menu. The luncheon and supper menus are brought to them and they may select from 4 or 5 different items. It is still hamburgers, two to one.

We find that these boys and girls seem to accept treatment better because they want to be considered one of the group. Also, if one in a room has a certain procedure performed on him, he is guaranteed to have an audience, and can describe later just how it felt. The average teen-ager seems to acquire a concern for the other fellow, too, and several days after admission may observe that his stomach ache probably is not as bad as the fellow's in the next bed.

As far as questions are concerned, they do ask quite a few. As Dr. Ahrens has observed, they demand more explanations than the little children. For example, they want to know why they cannot turn that little knob on the blood transfusion so it will go in faster; they do not want to hold their arm out straight all day.

We have had a few problems. For instance, the sandwich ritual every evening. The nurses go around each evening and find out what kind of sandwiches the boys and girls want before they go to bed, and if we have 12 patients, there are 12 different kinds of "Dagwood's" ordered every night. Within limits, they get them.

We also have occasional equipment problems. We run out of large bed sides which we need when patients are coming out of anesthesia. We do not have enough wheelchairs, which are very popular with the boys and girls not

confined to bed. We do not have enough screens. One of the purposes of having an adolescent unit was to guarantee privacy. This they do not always have. (Ed. note: Ceiling drop curtains have since been provided.)

The evening nurses also find that they have to plan their time a little differently because these patients are not ready for bed until 10 P.M. or after, whereas the young children are in bed by a little after 8 P.M.

For recreation we have television, records, books, and conversation. The ambulatory patients are allowed to visit one another's rooms after morning care and treatment, and we have had no problems there.

We really feel that this has been an interesting and valuable program. Besides the obvious fact that these adolescents are company for each other, they really appreciate the interest we have in them as people. For our part, the girls' chatter and the boys' incessant teasing really make the ward an enjoyable place to work.

Dr. Straight:

Adolescence is the time of life when there is a quickening in physical and psychological growth. It is also the age of contradictions, contradictions which are often bewildering to parents. The teen-ager wants to be independent, but desires controls and often wants to be dependent. Adolescence is the age of peak performances of muscle coordination and yet is the time of greatest awkwardness under social strain. Other contradictions are seen in the teen-ager's need to conform to a set dress, speech, and behavior among his peers, and the need occasionally to rebel and be different at home. These apparent contradictions in behavior and thinking are the ways of testing and trying to find answers for living.

Adolescence is the time of life when one's body feels strange. Now the teen-ager's body has shot up rapidly. What can he do with his wrists and ankles? The growth of secondary sex characteristics increases the feelings of strangeness. For girls the onset of menstruation brings mixed feelings, awkwardness, embarrassment, the need to hide a bodily function, but also pride in growing into womanhood.

We know that the normal adolescent is apt to be hypochondriacal. We think now this is part of the feeling of strangeness with a growing body. He examines his body more carefully, frequently peering into the mirror. He becomes critical of his features, picking one or two with which to be particularly dissatisfied. There is much concern over small twinges, minor skin irritations and the worry that something is wrong with the body. When such a child is ill, when there actually is a somatic disease, these concerns are reinforced, and may lead to greater anxieties or depressions or difficulties in management of the physical disease.

However, if he has the chance, he will often talk very openly with his

pediatrician or nurse about his concerns; in the case of a girl with rheumatic fever, "Will I ever be all right?", "Am I always going to be different from other people?"; or of a girl with menorrhagia, "Will the bleeding ever stop?". These worries (of dying, being different, being bedridden for a long period of time) can often be dealt with directly by the person who has known the patient for a long time, the pediatrician, by a simple explanation of what the illness is, and how it is to be treated.

On the Teen Unit we have found that the teen-ager likes to be in on what is happening. He is more co-operative if he knows what tests are going to be done and when. He likes to know ahead about the length of stay. He appreciates being told that he will be in for several weeks if that looks likely and will be more co-operative if he feels that he plays a role in his own care. Of course, he has a need for privacy. He likes to have his physical examination with his mother out of the room. He wants his pediatrician to explain the treatment to him as well as to his parents, perhaps even before the parents, so that he can take responsibility when he gets home for his pills, diet, and other procedures with his parents to back him up.

When is the Psychiatric Department called in on the Adolescent Unit? We go on rounds with the medical staff. There are several levels on which we work, for instance, for observation of a child who appears depressed, withdrawn, or has given difficulties in management of his medical illness. Some of these children need further diagnostic study, and a few are recommended for longer psychiatric treatment. In other cases Social Service or the Department of Psychiatry may help to relieve some of the strains in a family situation from which some of the emotional problems arise. In psychosomatic illness such as chronic ulcerative colitis the Psychiatric Department is part of the team in the total care of the child. When a patient has an illness partly emotional, such as anorexia nervosa, but which involves much careful medical care, the psychiatric consultant may do more intensive psycho-therapy.

We have found the adolescent floor a stimulating one from which to learn. It seems that the teen-agers feel comfortable with their old friends, the pediatricians, in a setting which is their own: The Teen Unit.

Dr. Parrott:

How does the average teen-ager react to continuing to visit his pediatrician? Before our adolescent unit was activated we interviewed a high school sorority group in order to hear their opinions. Several of the girls said they did not want to leave their pediatricians. They thought that it was a wonderful idea for the pediatrician to continue treating them and were "afraid" to go to another doctor. They thought they would be uncomfortable with another doctor.

Dr. Lichtenberg:

At the pediatric clinic of the Group Health Association we have gone through various phases in dealing with this problem. At first, for about five years, we accepted children only up to their thirteenth birthday, but many parents kept bringing their children in until they were 13 years and 364 days of age. It was quite apparent that they were not comfortable or satisfied in bringing their children to the adult department. We then changed the upper limit to 18 years and found that the older patients were a little bit beyond the resources of our group to manage. They objected to being in the same waiting room and even the office that was set up essentially for younger children. For the past ten years we have accepted them until their sixteenth birthday. While, on the whole, this works out satisfactorily, we nevertheless continue to have some problems. A few of the older children still object to being in the waiting room with the younger ones, as well as feeling that they lose face by being brought to a pediatrician, and we have declared them "adults" a year or two earlier. On the other hand, several of them do not want to leave us at 16 and ask whether they cannot come back just a few more times. Occasionally, after we have transferred one of the 16 year olds to our adult department, we find that when a particularly personal problem arises, he will ask to be seen by the pediatrician who had been taking care of him all the previous years, even though he has been attending the adult clinic and not been seen in the pediatric department for one or two years. When they have a real problem they want to return to their former pediatrician.

Dr. Parrott:

In summary of everything that we have tried to say today, I think that we all see a need for attention toward a medically somewhat neglected group. We see a need for special hospital care, and particularly private and ward outpatient care. We feel that these children deserve a clinic or a medical setting of their own where they can tell their own story to their own doctor. May I read a description of adolescence taken in part and revised from: Fullam, R. B., *The Popes On Youth*, America Press, N. Y., 1956, "Adolescence is a time of transition, of development, of vigorous pulsations. It is also a period during which young people become aware . . . of new powers (bursting) . . . from within themselves . . . Because of their inexperience with these strange new powers and the dangers of bewilderment and discouragement, youth needs understanding, and help . . .", and a very special, but unobtrusive attention. This last phrase is our own, "very special, yet unobtrusive attention". As we have said before, they do not want to be considered babies, they do not want to be considered adults, and yet they do not want to be singled out. We must find a way to deal with

them so that we do not intrude on their privacy, and yet offer ourselves to them both medically and emotionally, to help meet their problems.

ORAL INJURIES IN CHILDREN

A CENSUS STUDY

Frances B. Glenn, D.D.S.*

The frequency of general body injuries in children has been elaborated upon by many writers. Dietrich⁽¹⁾ feels that accidents constitute the greatest threat to the child's life, and that many injuries are preventable. A report of the National Safety Council⁽²⁾ showed that 12,000-13,000 children a year are killed in accidents in the United States; 40,000-50,000 children are permanently injured and one million each year seek medical attention because of accidents. Of the children killed, 6,500 a year are under 5 years; one-half of all fatal childhood accidents occur in the first third of childhood. Rice, et. al.⁽³⁾ in a study of 1861 cases reported that the most frequent age for accidents was 1-4 years; 5-9 years and 10-14 years were the age groups next in order. He reported that boys were more frequently involved in injuries than girls, and that home accidents were three times as frequent as automobile accidents in children. He also noted that falls constituted the most common type of accident, with impact and cutting or piercing types following. Sixty-six per cent of his reports came from the emergency rooms of hospitals.

The psychological "why" of so many accidents has led numerous communities to develop child safety programs and has led a number of investigators to study the personalities of children involved in repeated accidents. Fuller⁽⁴⁾ suggests that there are "injury-prone" children who constantly get hurt. These children often are the offspring of parents who have been involved in accidents of a serious nature. Langford, et al.⁽⁵⁾ describe the accident-prone child as overactive and restless. He tends to be impulsive; he is liked by adults but not well liked by his playmates. He does not get his dependency and security satisfactions at home. He tends to want to be older than his age and to over-extend himself in his activities as he tries to keep up with his ambitions or seek acceptance by the group. He does not retreat from dangerous situations. He has a very poor reaction to stress, becoming more impulsive and disorganized.

The maturation of the child certainly seems to be correlated with the age of greatest accident frequency. Gesell⁽⁶⁾ states that the average child at 10

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months begins to creep and help to pull himself up in his crib; at 15 months he walks independently and stands alone; at 18 months he runs, climbs stairs, and seats himself. From 21 months to 4 years he starts to walk backward, maintain his balance, stand on one foot, and walk on tiptoe. At 5 years he hops on one foot and is able to walk on a 4 cm. wide board without stepping off.

Oral trauma accounts for many minor and serious injuries. These accidents, in general, follow the same patterns of age and type described for general body injuries. The following report is submitted as evidence of the above statements.

Over a 10 months' period at the Children's Hospital of D. C. there were 172 oral injuries seen and treated by the dental resident. Table I describes the various types.

In routine examination of patients in the dental clinic a total of 101 fractured incisors has been seen; these fractures had occurred as long as 1 to 4 years before observation at the clinic. The injuries in a number of children involved several types. Lacerations accounted for 46 per cent of oral injuries with fractured incisors and fractured alveolar processes next in order. It is interesting to note that only 6 cases included fracture of both incisors and alveolar processes. Evidently either one or the other bears the brunt of stress in most cases; very seldom is the force distributed to both. Partially extruded teeth accounted for a sizeable number of cases; this type of injury often makes it impossible for the child to close his mouth.

Table II describes the site of the accident.

Table II indicates that 87.2 per cent of oral injuries occur in the home. Sidewalks and steps provide the most frequent areas involved in falls; in

TABLE I

Fractured incisors—35
Alveolar process fractures—16
Fractured incisors with alveolar fractures—6
Maxilla 3, Mandible 3
Gingival laceration—41
Frenum lacerations—12
Extruded teeth (partial extrusion)—19
Completely extruded teeth (knocked out)—6
Retruded teeth—9
Swallowed teeth—2
Tongue lacerations—3
Alveolar ridge lacerations—2
Maxilla or mandible body fractures—1 (maxilla)
Lip (involving inner mucosa) lacerations—20

Total—172

TABLE II

A. Automobile accidents		
1. Crash (passenger)—7		
2. Hit by car (pedestrian)—3		
		Total 10
B. Injuries in and about the home:		
1. Fell from:		
a. Bicycle—5		
b. Carriage—2		
c. Furniture (chair, sofa, bed, table)—10		
d. Steps—13		
e. Boatlandings—3		
2. Fell on:		
a. Floor—8		
b. Sidewalk—14		
c. Object (bottle, flowerpot)—2		
3. Fell against:		
a. Lamppost—2		
b. Dashboard—1		
4. Hit by:		
a. Another child—11		
b. Baseball or baseball bat—4		
c. Swing—2		
d. Basketball—1		
		Total 78

TABLE III

	0-5 Months	6-11 Months	1-3 Years	4-6 Years	7-13 Years
No. of cases.....	0	2	33	24	19
Per cent.....	0	2.5	42.3	30.8	24.4

addition, children running into each other while playing are frequently hit in the mouth. Automobile accidents in this series account for only 12.8 per cent of mouth injuries. This figure may be low since a complete mouth examination may be postponed in an unconscious child, and/or one with general body injuries involving the long bones. The variety of objects with which a child may effect an oral injury seems to be unlimited: there is "no safe place" for a child.

Table III describes age distribution.

It may be seen that the highest frequency of oral accidents occurred in the age group 1-3 years. Over 70 per cent of cases occurred in the pre-school age group.

As pointed out by Lyons⁽⁷⁾, injuries of the mouth and jaws are totally within the purview of dental management and are completely dependent on

dental judgment and decision. The injury may include abrasion of the soft tissues, fractures of the teeth with or without pulp involvement, fractures of the alveolar bone which supports the teeth, or fractures of the mandible or maxilla proper. If the injury extends to the outside of the lips and face, the services of the plastic surgeon are often indicated.

It is beyond the scope of this paper to describe in detail the treatment that may be necessary in oral injuries, but a brief synopsis is given:

- 1) Lacerations: Lacerations of the mucous membranes may or may not



FIG. 1 A

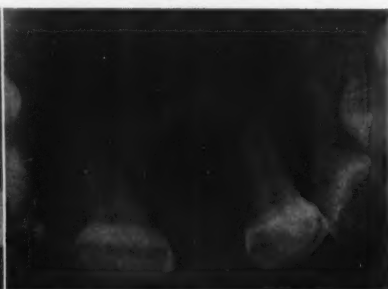


FIG. 1 B

FIG. 1 A. Preoperative roentgenogram in twelve year old colored boy showing displacement of maxillary right central and left lateral permanent incisors.

FIG. 1 B. Post-operative roentgenogram showing splint in position for stabilization of the loose teeth.



FIG. 2 A



FIG. 2 B

FIG. 2 A. Loss of maxillary right lateral permanent incisor in a nine year old colored boy due to collision with a lamppost.

FIG. 2 B. Post-operative: Replantation and splinting of the extruded tooth following root canal therapy.

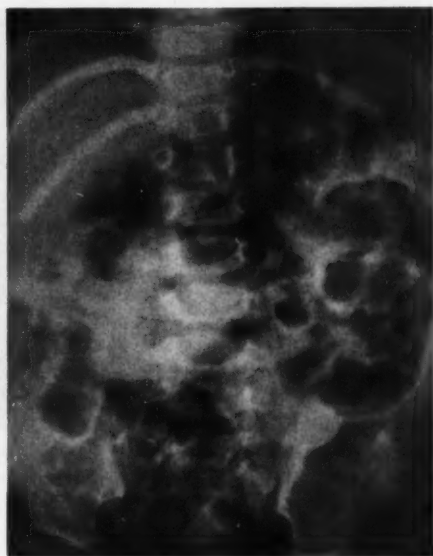


FIG. 3. Swallowed mandibular deciduous left central incisor in the stomach of a six months old Chinese boy subsequent to striking the mouth against edge of carriage. This was treated conservatively.

need to be sutured, depending on their extent. Frenum lacerations often need to have at least one suture placed to cut off a bleeding point. In one child with hemophilia, suturing a lacerated frenum at the mucobuccal fold was lifesaving.

2) Extruded and retruded teeth: Extruded or retruded teeth may in some cases be re-positioned if seen soon after the accident. Force applied must be gentle and along the long axis of the socket. Extruded teeth interfering with the occlusion of the teeth may have to be extracted. Re-planting a permanent anterior tooth that has been completely avulsed may be a therapeutic consideration. Although the prognosis for replantations is generally about 5 years, they may serve the patient until he is of the age to permit construction of a permanent bridge.

3) Fractured teeth: A tooth with a fractured root may or may not be retained, depending on the fracture location. Crown fractures may need to be covered by a pulp capping agent and a crown placed. The prognosis of the tooth's vitality depends on how soon after the accident dental therapy is rendered.

4) Fractured maxilla or mandible: In cases of alveolar process fracture, stabilization of the labial and lingual plates may be accomplished by su-



FIG. 4. Extreme extrusion of maxillary right permanent incisor in a seven year old colored girl resulting from an automobile collision. The tooth was extracted.

tures. Sometimes loose spicules of bone need to be removed; in other cases they are in position and may be retained.

5) Fractures of the body of the mandible may require extra-oral fixation and/or intra-oral wiring.

6) Minimum routine procedures in addition to the above procedures include:

- a. Intra-oral or lateral jaw radiogram.
- b. Cleansing the lacerations with merthiolate and/or saline.
- c. Tetanus toxoid or antitoxin, depending on patient's immunization history and cause of injury.
- d. Antibiotics—If patients's mouth hygiene is poor, long or short acting penicillin, or another suitable antibiotic if penicillin hypersensitivity is present.
- e. Ice pack on 15 minutes, off 20 minutes every three hours following injury.
- f. Saline rinses four times daily.
- g. Oral Hygiene—Brushing immediately after eating. If child is too young to brush (under 16 months) mother should wipe out the mouth with saline or plain water sponge.
- h. Aspirin every four hours, if needed for pain.

SUMMARY

Oral injuries are perhaps more frequent than is generally realized. Over 42 per cent of cases occur in the 1-3 age group; this is apparently correlated

with the child's development: standing, walking, running, and climbing. Most oral injuries occur inside or just outside the home; falls on sidewalks and steps account for the greatest number although the various objects and places involved are innumerable. Gingival, frenum and lip lacerations are common; fractured incisors, and alveolar process fractures constitute the injuries next in order of frequency.

Oral injuries are within the purview of treatment by the dental practitioner. Treatment is most effective if rendered soon after the accident.

The child's mouth is an integral part of his being; it is subjected to disease and trauma just as any other part of the body. The maintenance and treatment of the oral cavity make for a healthy child.

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THE EFFECTS OF INTRAMUSCULAR TRYPSIN IN POSTOPERATIVE PEDIATRIC NEUROSURGICAL PATIENTS

A PRELIMINARY REPORT

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Marked facial edema frequently appears following surgical operations upon the head, particularly when the procedure is directed at or anterior to the coronal suture. The importance of such swelling is more than cosmetic.

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Although seldom a problem after the first postoperative week, the initial edema may be so severe that the eyelids cannot be opened. Near panic can occur, especially in young children who may think that they have become blind. Conjunctivitis may result from improper function of the lacrimal apparatus due to severe periorbital edema.

In view of the favorable reports on the use of intramuscular trypsin in reducing the edema associated with lacerations and contusions^(1, 2) it was decided to determine its effect on post-craniotomy facial edema.

The first patient in our series constituted an interesting control, and stimulated us to continue to test the enzyme. This child required bilateral craniotomies in two stages for removal of subdural membranes. The two operations were identical in location, surgical technique, and pathological findings. There was no postoperative infection associated with either procedure. No trypsin was given following the first fronto-temporal craniotomy. The periorbital tissues became so swollen that the eyelids could not be opened. Definite periorbital edema was still present one week after surgery. The postoperative course was further complicated by a conjunctivitis which appeared several days after surgery, and persisted for approximately one week in spite of local antibiotic therapy.

Following the second operation, 2.5 mg. of aqueous intramuscular trypsin was administered every eight hours for three days. Only slight swelling of the eyelids appeared postoperatively, and that cleared within four days.

The medication has been prescribed in a similar manner with comparable results following surgery on the head in 12 other children. Only mild facial edema has appeared when trypsin therapy was initiated immediately after such edema-provoking operations as a plastic repair of a coronal craniotomy scar and a bilateral opening of the coronal sutures for turrecephaly.

No signs of sensitivity or toxicity appeared in the postoperative patients. In one adult patient not otherwise included in this series, however, local induration with subjective burning and pruritis appeared following the fifth injection. The complaints cleared promptly after administration of antihistamines.

DISCUSSION

There may be additional benefits from postoperative administration of aqueous trypsin which would comprise sufficient indication in themselves for its use.

We speculate that the demonstrated ability of aqueous intramuscular trypsin to reduce *external* postoperative swelling may extend to *internal* or intracranial swelling as well. Such an effect would be of benefit in providing a safer transport of the postoperative neurosurgical patient through

the first 72 hours of reactive brain swelling. In addition, it would offer valuable aid in the closed or nonsurgical type of head injury, in which survival of the patient may well depend upon the physician's ability to keep the intracranial pressure below the mortal level. It is our clinical impression that increased intracranial pressure due to edema is moderated by trypsin. Further studies of this effect are in current progress.

The importance of a free airway in postoperative neurosurgical patients is well known. Reports in the literature describe the action of intramuscular trypsin in decreasing the viscosity of respiratory tract secretions in chronic pulmonary disease⁽³⁾, as well as in such conditions as bulbar poliomyelitis⁽⁴⁾. We have noted an increased ease in suctioning unconscious patients receiving intramuscular trypsin, in addition to greater efficacy of coughing in those more alert. The safety of intramuscular trypsin poses a distinct advantage over the iodides.

Intramuscular trypsin has been successfully employed in the treatment of thrombophlebitis⁽⁵⁾, and may well have some prophylactic effects, particularly in bedfast older patients.

SUMMARY

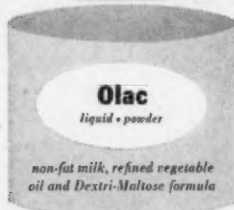
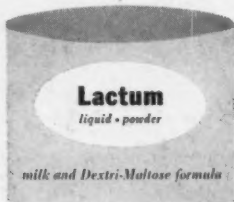
Intramuscular trypsin in a dosage of 2.5 mg. in aqueous solution at eight hour intervals for several days was administered postoperatively to 12 pediatric patients following cranial surgery. Definite reduction in postoperative facial edema was observed. The effects of the enzyme in adult postoperative neurosurgical patients and its ability to modify intracranial pressure will be considered in a subsequent report.

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